cytoplasm or by autonomous insertion into the lipid bilayer. Fusion (1) is appropriate if the amino terminus of the minor coat protein is free and (2) is appropriate if the carboxy terminus is free. It is possible that both (1) and (2) will work. Fusions (3) and (4) are appropriate if the minor coat protein attaches to the phage from the paraplasm or from within the lipid bilayer. Fusion (3) is appropriate if the amino terminus of the minor coat protein is free and (4) is appropriate if the carboxy terminus is free. It is possible that both (3) and (4) will work. It is also possible that all four constructions will work and, for any particular minor coat protein, that none of them will work.

Although no fusions of M13 gene VIII to other genes have yet been reported, knowledge of the virion 3D structure makes attachment of IPBD to the amino terminus of mature M13 coat protein (M13 CP) quite attractive (See Sec. 1.3.2). Should direct fusion of BPTI to M13 CP fail to cause BPTI to be displayed on the surface of M13, we will: a) vary part of the BPTI sequence and/or insert short random DNA sequences between BPTI and M13 CP (Sec. 1.3.4); b) examine and, perhaps, change the promoter and Shine-Dalgarno sequences; c) examine and, perhaps, change the signal sequence.

Smith (SMIT85), Parmley and Smith (PARM88), and de la Cruz et al. (CRUZ88) have shown that insertions into gene III cause novel protein domains to appear on the virion outer surface. If BPTI can not be made to appear on the virion outer surface by fusing the bpti gene to the m13cp gene, we will fuse bpti to gene III either at the site used by Smith and by de la Cruz et al. or to one of the termini. We may use a second, synthetic copy of gene III so that some unaltered gene III protein will be